

### REMARKS

Claims 1, 5, 7-9, 11, and 13 are amended. Marked up versions of those claims are attached hereto pursuant to 37 C.F.R. § 1.121(c)(ii). Claims 1-13 remain pending for examination. Reexamination and reconsideration of the application, as amended, are respectfully requested.

#### Formal Objections and Rejections

The Examiner's acknowledgement of the applicants' priority to claim is respectfully acknowledged. Applicants' counsel are assembling the now obtaining the required priority documents, and will submit them in due course.

The drawings were objected to because the same reference character -- "29" -- was used to designate both "electrodes" (page 8) and "pads" (page 13). These are in fact two synonymous terms for the same physical element. Rather than changing the drawings, therefore, the specification has been amended at page 13 so that "electrodes" are referred to in both cited locations.

The drawings were further objected to as including Japanese text. Proposed substitute drawing sheets are attached hereto for the Examiner's review and approval.

The specification was objected to for asserted informalities at pages 7 and 9. These deficiencies have been corrected by amendments made in this paper.

Claims 1-13 were rejected under 35 U.S.C. § 112 for the use of the terms "sucked" and "sucking," allegedly in a manner contrary to the usual meaning of those terms. The claims have now been amended to substitute "holding" for the objectionable terms, and this amendment is believed to correct the asserted deficiencies. Applicants' counsel contends, moreover, that this is an amendment of form only, for clarity, and not one that narrows the scope of any of the claims. No estoppel should arise out of this formal amendment.

Art Rejections

Claims 1-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over (1) Sakemi '283 or (2) Nakazato '775, in view of Sakemi '704, Sakai '260, or Nakazato JP 8-115942. These rejections are respectfully traversed.

The invention of claim 1 is a ball mounting apparatus for mounting a plurality of balls on a workpiece. Claim 1, as amended, requires a head for holding the balls, and a clamping device *for clamping the head*. None of the references cited against claim 1 include this feature.

The Examiner acknowledges that "Sakemi et al. ('283) do not specifically disclose a separate clamping means and process to hold the energized force applied by the spring." (Office Action, at page 5.) Sakemi '704 describes apparatus for clamping *a template frame*, but no such apparatus for clamping a head as claimed. Sakai describes apparatus for clamping *a workpiece*, and Nakazato "teaches a solder ball mounting apparatus in which an oscillator disposed on a clasper at the positioning part of a board." None of these references describes or suggests apparatus for clamping *a head* that holds the balls, as claim 1 requires.

Claim 1 is thus patentable over the cited art. Claims 2-4 all depend directly from claim 1, and by definition include all of claim 1's limitations. Prompt allowance of claims 2-4 is therefore respectfully requested. If the Examiner persists with this rejection, the Examiner is respectfully requested to indicate in which references and where the Examiner finds the required disclosure of a "clamping device for clamping said head" so that the applicant can understand and respond better to the rejection.

Method claim 5 is analogous to claim 1 in that claim 5, as amended, requires "moving a clamped head," "holding said balls on said head," "releasing a force clamping said head," and "clamping said head." As noted above, none of the cited references describes or suggests clamping (or unclamping) a ball-holding head, and claim 5 is thus patentable over the art cited against it. Claims 6-13 depend from claim 5, and the prompt allowance of claims 5-13 is thus respectfully requested. Again, too, if the Examiner persists with this rejection, the Examiner is respectfully

requested to identify with particularity what portion of the references describes clamping *the head*. The Examiner's cooperation in this regard will be most appreciated.

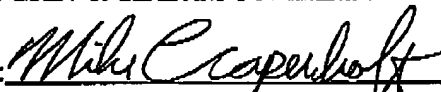
In view of the foregoing, it is respectfully submitted that claims 1-13 and the application as a whole are in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,  
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Date: June 4, 2002

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Version with markings to show changes made:

In the specification:

At page 6, line 28 – page 7, line 2:

Further, a mechanism which spouts air from under the balls 2 piled up also can rock the balls 2 in the same way as the vibrator 3. In the case adopting this mechanism, if the head 4 is not lowered in the group of the balls 2, it takes a long time to suck up the balls 2 and there [happen the] can be suction holes 25 which can not suck up the balls 2, because a height where the balls skip is very low.

At page 9, lines 8-20.

It is most preferable that the energized force of the spring member 16, in a condition of equalizing a pressure of the cylinder 15 to zero, is designed to be a force by which the head 4 can be lifted to the upper positioning 19. Also, it is preferable that the energized force of the spring member 16, in the condition of equalizing the pressure of the cylinder 15 to zero, is designed to be the force by which the head 4 is hold between the lower positioning 18 and upper positioning 19. Moreover, the energized force of the spring member 16, in the condition of equalizing the pressure of the cylinder 15 to zero, may be designed to be the force by which the head 4 remains on the lower positioning 18. But, in this case, the force by which the head 4 is pressurized to the lower positioning 18 may be reduced under 1Kgf by the energized force making the spring member 16 return upward. If the force by which the head 4 is pressurized to the lower positioning 18 is in excess of 1Kgf in spite of being reduced by the energized force of the spring member 16, the balls 2 stick to the suction holes 25 provided at the head bottom 5. Therefore, the balls 2 are not transferred completely onto the workpiece 12, [so that extra balls occur] some of the balls instead remaining stuck to the head.

At page 13, lines 10-20.

Fig. 8 schematically shows a process of mounting the balls 2 onto the [pads] electrodes 29 provided on the workpiece 12 after the balls 2 are dipped into the layer filled with the flux 27 and the flux 27 is applied to the balls 2. Fig. 8(A) shows a state in which the head 4 is moved above the opening filled with the flux 27 which is formed to the thickness corresponding to the amount which should be applied to the ball 2. Fig. 8(B) shows a state in which the balls 2 sucked up to the head 4 counterbalanced the self-weight are lowered to a bottom of the flux layer. Fig.8(C) shows a state in which the head 4 is raised after the flux 27 is applied to the balls 2. Fig. 8(D) shows a state in which the head 4 is moved above the workpiece 12. Fig. 8(E) shows a state in which the head 4 is lowered more after the head 4 counterbalanced by the self-weight is lowered, contacting the flux 27 with the pads 29. Fig. 8(F) shows a state in which the balls 2 applied with the flux 27 are mounted onto the [pads] electrodes 29 provided on the workpiece 12.

**In the claims:**

1. (Amended) A ball mounting apparatus for mounting a plurality of balls [sucked up to] held by a head on a workpiece, said ball mounting apparatus comprising:
  - positioning mechanism for positioning said workpiece;
  - ball supply device for supplying said balls;
  - said head for [sucking up] holding said balls;
  - energized force generating device for energizing said head in an upward direction;
  - clamping device for clamping said head in a condition in which said energized force generating device stores an energized force; and
  - moving mechanism for moving said head.

2. The ball mounting apparatus according to claim 1, wherein said energized force generating device is a spring member, and said spring member provides said

energized force which is able to lift said head above a lower positioning constituting a part of said clamping device.

3. The ball mounting apparatus according to claim 1, wherein said clamping device comprises a cylinder and a lower positioning.

4. The ball mounting apparatus according to claim 1, wherein said workpiece is fixed on a holding table by bellows-shaped suction pads.

5. (Amended) A ball mounting method for mounting a plurality of balls [sucked up] held by a head on a workpiece, said ball mounting method comprising the sequential steps of:

moving a clamped head above a ball supply section;  
[sucking up] holding said balls [to] on said head;  
moving said head above said workpiece;  
releasing a force clamping said head;  
mounting said balls [sucked up to] held on said head on said workpiece;  
clamping said head; and  
moving said head above said ball supply section.

6. The ball mounting method according to claim 5, wherein in the step of clamping said head, a force clamping said head is in the range of about 2Kgf to 30Kgf.

7. (Amended) The ball mounting method according to claim 5, wherein in the step of [sucking up] holding said balls [to] on said head, a total of said balls occupies about 5 to 80 % by area of a bottom area of a container.

8. (Amended) The ball mounting method according to claim 5, wherein the step of [sucking up] holding said balls [to] on said head includes [sucking up again] holding

said balls [to] on said head for a second time after temporarily [stopping sucking up] detaching the balls from the head and dispersing agglomerated balls while bringing the balls into contact with the head [sucking up said balls].

9. (Amended) The ball mounting method according to claim 5, further comprising the steps of:

counterbalancing a weight of said head [sucking up] holding the balls substantially to zero;

lowering each tip of said balls to a bottom of a flux layer; and  
applying flux to said balls.

10. The ball mounting method according to claim 5, wherein the balls are conductive, the method further comprising a step of applying a conductive adhesive to said balls.

11. (Amended) The ball mounting method according to claim 5, wherein in the step of mounting said balls [sucked up to] held on said head on said workpiece, a force clamping the head with a pressure of a cylinder to a lower positioning constituting a part of a clamping device for the head is less than or equal to about 1Kgf.

12. The ball mounting method according to claim 5, further comprises a step of dropping said balls remaining on said head by knocking said head with a hammer, after the step of mounting said balls on said workpiece.

13. (Amended) The ball mounting method according to claim 5, wherein in the step of mounting a plurality of said balls [sucked up to] held on said head on said workpiece, a weight of said head is substantially zero by counterbalancing the weight of said head by an energized force of an energized force generating device by releasing a pressure of a cylinder clamping said head.

In the drawings:

[Proposed substitute drawing sheets are attached hereto for the Examiner's review and approval.]